SUMMARY

OF THE

IMPROVEMENTS AND DISCOVERIES

IN THE

MEDICAL SCIENCES.

ANATOMY AND PHYSIOLOGY.

1. *Contributions to the Physiology of the Human Ovary.*—The *London Medical Gazette* contains a series of very interesting articles on the physiology of the human ovary, by CHARLES RITCHIE, M.D., of Glasgow. The following are his general conclusions

1. The ovary is the primary sexual organ in the unimpregnated human female, as the uterus is in the gravid, and the mamma in the lactating, and exercises a remarkable controlling power both on its own functions as a gland, regulating them according to existing circumstances, and also on the character of the development of the other organs; properties recognized at least tacitly by the ancients, in their designation of the ovaries as the female testes.

2. The vesicles of the ovary were known to anatomists long anterior to the work of De Graaf; but were supposed to be dilated continuations of the seminal blood-vessels, in which, as in so many subsidiary chambers, the conversion of the blood into semen was completed.

3. The term ova, as applied to the germs of the mammalia, was employed from the time of Hippocrates, but they were supposed to be exclusively of uterine formation, and the result of fecundation, at least in their normal form, till the period when Kerckring, De Graaf, and others, attracted to the subject seemingly by Harvey's *Exercitationes*, demonstrated their origin to be in the ovaries, and antecedent to impregnation.

4. The fact of the discharge of sterile ova by virgin birds, and by fishes and insects, was familiar to Aristotle and others, but Kerckring, who wrote about a year before De Graaf, made the additional statement, that such ova are evacuated from the ovaries of quadrupeds, and also unconsciously by the unimpregnated human female, "instante purgatione menstruâ, aut stimulante libidine;" and the physiologists who commented on his treatise indulged in analogical generalization on the oviparous origin of the whole animal series, and on the spontaneous emission of germs from the ovaries, and their fecundation in the uterus, precisely as has been done in the present day.

5. There is reason to believe that what Kerckring supposed to be ova were merely portions of fibrin, but it is probable that the demonstration of the truth of the first and second of the views now referred to, of his commentators, which has been accomplished in our own time by MM. Bischoff and Raciborski, was prevented being reached, when they were first propounded, by the course of investigation having been turned by De Graaf and succeeding inquirers from the condition of the ovaries in the virgin, to their state in animals which had received the male.

6. The ovarian vesicles formerly mistaken for amphoric enlargements of the seminal vessels, were, after Kerckring and De Graaf, mistaken for ova, although by Morgagni in particular, and also, but on erroneous premises, by Malpighi, and even after a confused manner by De Graaf, the discovery made recently by Von

Baer of these vessels as being alveoli only in which the ova are retained, was distinctly anticipated.

7. The statements made by Baron Haller, and repeated by his followers, that ova are formed from the fluid of the ovarian vessels changed by impregnation, and afterwards discharged into the tubes, in which it assumes the ovoid form by coagulation; and that the number of follicles in the ovaries is limited absolutely to from twenty to thirty in each female, are equally erroneous; ova at least, and generally their containing cells, being formed and secreted in indefinite numbers from the ovaries by the inherent organism and power of the latter as glands, throughout every period of female life.

8. The opinion held by Galen, and resuscitated after a long interval of renewed belief in their cæcity, by Fallopius, of the perviousness of the uterine tubes, and that of their systolic and diastolic action, and of their conducting power from within at the ovaries, outward to the uterus, are correct.

9. The antrum tubi of Rœderer is a hernial extrusion of the mucous and peritoneal coats of the tube, arising from the separation of the muscular fibrils, most probably by some mechanical cause, as the pressure of the fluid of the tube during the orgasm of the latter.

10. The incurvated distal extremities of the tubes are true receptacula ovarum, in which ova discharged from the ovaries may be retained for a short but indefinite time.

11. The tubes are at once oviducts and vasa ejaculatoria.

12. In early infancy, extreme old age, and long-continued organic disease, the ova are minute, transparent, and structureless cells; and in advanced childhood, soon after the critical age, and during pregnancy and lactation, they are more or less organized, larger, and in the latter state are often so well maturated, that about one-third of the renewed pregnancies of married women take place while they nurse.

13. In the children and others in the circumstances now mentioned, the exercise of organic power which occasions the secretion and extrusion of ova, is attended also by that of an opaque mucous fluid in the tubes and uterus; but on the attainment by the female of maturity, and onward to the period of critical life, [when the animal powers become again diminished, and the calibre of the arteries reduced,] the ovarian orgasm, like many other vital actions, undergoes periodical augmentations of power, during which, unless when prevented by the disturbing influence of other functional processes or by disease, it extends to the nervous and vascular tissues of the uterus, and gives rise to the formation within this viscus of decidual vessels, which exude lymph and red globules, the latter being evacuated, mixed with watery fluid, mucous matter, and some of the salts of the blood, in the form of menstruation.

14. Every sanguineous uterine discharge, even when of moderate quantity and proceeding from a healthy uterus, is not necessarily of the normal menstrual kind here described, that is, the product of an ovarian orgasm, or natural function, acting through the medium of arterial villi shot out from the inner surface of the uterus, the blood in some such cases having been seen after death, proceeding from the open mouths of the uterine veins; and there being reason to believe that such a hemorrhage may be excited by whatever either temporarily or more permanently obstructs the venous circulation of the uterus, as the action of sudden fear, or of disease in the lungs or left heart, on the circulation of the right side of the heart; of tight lacing or other causes on that of the abdominal cava; and that of extensive ovarian enlargement on the corresponding veins of the uterus; but that to confound such discharges, which are generally coagulable, and met with in abnormal circumstances, with the catamenia, is to mistake a pathological phenomenon for the result of a vital and healthy function.

The frequent intermixture, again, of both arterial and venous blood with the ordinary menstrual secretions, which may be asserted to happen in women with profuse menstruation, is explicable on the principle, in the one case, of the operation of an unnatural intensity of the proper catamenial orgasm, and in the other, of that of an augmented irritability of the muscular fibres of the uterus, retarding by their spasmodic contraction the flow of blood in its veins.

15. The fact that the ovaries do undergo a periodical increase of size before and

at the usual menstrual terms, is capable of diversified proof in various forms of disease of these glands, and has also been demonstrated in their healthy condition, as in the case of their hernial protrusion.

16. That this congestion is not caused by the presence or bursting of ripe vesicles is plain from the consideration that the ovaries are often crowded with such, some of which also occasionally give way, and empty themselves by capillary-sized openings in the surface of the glands in women who have never menstruated; and in others who have ceased to menstruate, one and two large and fully developed vesicles are frequently seen.

17. The catamenia are never regularly secreted without the Graafian vesicles attaining a state of high organization, and being, in general, ruptured before they reach a larger bulk than that of a dried, or at most of a recent pea, the breach in their walls being facilitated by a considerable absorption of their peritoneal covering; while, when follicles of great natural strength exist in the ovaries independently of menstruation, as often occurs before its establishment and at its cessation, they are perforated with difficulty, remain long intact, often acquire an abnormal size, and their discharge, when it happens, is by a minute opening in the peritoneum, which corresponds with the size of that in their own walls.

18. The elimination of ova, and the process of menstruation, are correlative effects of the vital powers of the ovaries (just as the secretion of mucus, and of gastric juice, and the chymification of the blood, are of those of the stomach), and to suppose the rupture of the Graafian vesicles to be the cause of the menses, is to mistake a frequent association, and, to some extent, effect, for a uniform cause.

19. The principal use of menstruation is, in regard to the ovary, to provide an accessory by which the maturation of its vesicles, and the absorption of their peritoneal and tenacious proper coats, and their extrusion generally, may be promoted throughout the child-bearing period of life; and, in reference to the uterus, to furnish a nidus within its walls by which the ovary may be entangled, retained, and nourished.

20. Despite the discovery, in three or four instances, of zoospermes on the ovaries of some quadrupeds, *post coitum*, the amount, variety, and character of the proof against the ovarian theory of generation in the human subject, appear to be insurmountable; and, in addition, the positive evidence in favour of the uterus being, at least in man, the normal seat of conception, and its occurrence in the tubes or ovaries exceptional only, seems conclusive; the cases of the latter which take place depending probably on the escape of spermatozoa along the tubes during menstruation, or on some accidental and rare arrangement of the mucus in the uterine ends of these, by which it becomes a conducting medium for the passage of the seminal corpuscles towards the ovaria.

21. Although menstruation may return for several successive periods without being attended by the formation of any of the organized bodies called corpora lutea—and that, simply because every menstruation is not necessarily preceded or accompanied by the rupture of a vesicle—the bodies so named are yet never found in the human female unless in association with that function, and in vesicles which have been ruptured in immediate connection with one of its returns; the vascular orgasm of the ovaries, which is the essential element of menstruation, being, also, the cause of corpora lutea.

22. A more correct descriptive generic term for these bodies, therefore, would be that of corpora menstrualia, or, in reference to the lower animals, corpora periodica; the different species being arranged according to their physical peculiarities, as corpora cephaloidea, and corpora albida, after the manner described in the first series of these Contributions.

23. Of these organized forms of corpora menstrualia, some, as the white and intra-mural cerebriform species, are *primary*, being formed exclusively under the influence of the congestive menstrual nisus; and others, as the red, and extra-mural cerebriform varieties, are *secondary*, being transformations respectively of the two primitive species, and are produced by the reflex action on the still patent vessels of the recently ruptured vesicles, of the excited and congested gravid uterus.

24. The thickened, movable, œdematous, and yellowish state of the inner

membrane of the unruptured Graafian vesicles, described by MM. Baer and Wagner, as the consequence of impregnation, and the initiative of the corpus luteum, and which M. Bischoff observed in a dog which had not received the male, is often seen in the unbroken follicles of the human ovary, and is totally unconnected with pregnancy.

25. The swollen, puffy, or congested condition of the lining membrane, is best observed, in woman, in the larger vesicles, in which it projects as a vascular corrugated pulp, apparently produced by the effusion beneath the inner layer at points where this does not adhere organically, but merely by juxtaposition with the external, of a transparent fluid; the adhering portions of the two laminæ often remaining opaque or slightly yellowish, and communicating, from their arrangement in the form of decussating lines, a reticulated or chess-board aspect to the whole.

26. There is reason to believe that those changes are caused by the congestive orgasm of menstruation, and constitute the first stage in the growth of both species of primitive corpora menstrualia, the effusion in the one, or that of the white bodies, being limited to the cellulated structure of the ruptured membranes, which speedily becomes opaque, thickened, and inorganic: while in the other, or cerebriform bodies, the effusion is more copious, is granular, well organized, and deposited in the shape of convolutions between the layers of the vesicular parietes precisely in those spaces where the surfaces of the latter are free, the form of the convolutions being contingent on the situation of the adhesions or septa.

27. Immediately on the establishment of pregnancy, a reflex vascular influence arises towards the ovaries from the engorged and excited uterus, which, in the event of the existence in these glands of either of the above primitive menstrual bodies, terminates, in the case of the last described species, on the vessels of its membranes and granular matter, increasing the size of the former, and the tenacity, bulk, and succulency of the latter, till, in the last months of pregnancy, its yellow tissue assumes a rose colour, and the body is transformed into the variety called corpus rubrum; while in those other cases, in which the primitive body has been of the species termed a corpus albidum, the uterine nisus, in consequence of the obliteration of the vessels ramifying immediately on the vesicle, does not extend further than the still patent vessels which connected the exterior of the follicle to the stroma of the ovary, in which situation a granular deposit takes place, as a secondary formation, arranged in an annular form around the thickened vesicle; and sometimes, in consequence of the continued plethora of the parts, this structure, which constitutes the extra-mural cerebriform variety of corpora menstrualia, may be found in the last months of pregnancy undergoing a third transformation, and exhibiting a reddish hue.

28. The perfection of development in a corpus menstruale, whether primary or secondary, will be proportioned to the number, size, and vital activity of the vessels of the ruptured vesicle at the periods respectively of menstruation and impregnation; and as such properties in the vessels of the follicle must alter speedily, and also progressively, on the evacuation of the latter, it is reasonable to conclude that the changes wrought on its coats, either by menstruation or gravidity, will be much modified by the length of the period which intervenes between its rupture and their accession—a fact which explains, not only the differences of degree in which such bodies are developed, but which also indicates the possibility of both menstruation and impregnation taking place in some abnormal instances without being succeeded by the formation of their characteristic sequelæ in the ovaries.

29. Should two or more Graafian vesicles have been recently and simultaneously ruptured before fecundation, the series of changes which make up the concrete of what is called a true corpus luteum of the species described in this paper as cephaloid, in its two forms of extra and intra-parietal, and, although not yet verified by the writer, also, he believes, in the only remaining form—that of the corpora rubra, will take place indifferently in them all; while, should there have been only one Graafian vesicle ruptured, which has yet happened to contain two ova, both of which have been impregnated, or two vesicles ruptured, the vessels of one of which only remained permeable to the transudation of gra-

nular matter at the commencement of the pregnancy, there will, should both ova be impregnated, be two fœtuses in the uterus, and no more than one secondary menstrual body in the ovaria.

30. Taking into view the extra-ovarian and reflected nature of the cause which converts the primitive corpora menstrualia of the unimpregnated female into their secondary varieties during utero-gestation, connectedly with the previously ascertained facts of the subject, there does not appear to be anything impossible in the supposition, that, in the event of a morbid orgasm of the uterus, such as might accompany several of its diseases of structure, being set up immediately on the formation of a corpus menstruale, that the irritation and plethora of the uterus might become extended to such body, and control its development, somewhat in the manner of pregnancy.

31. Yellow or black, unorganized deposits (the corpora florida and nigra of the former series), enclosed either in unruptured or broken vesicles, having their coats stained, but of natural consistence, are seen in the ovaries in every stage of life; but they are, so far as the writer has ascertained, nothing more than mere blood marks—the colour of the vesicles being the product of mechanical and not of vital changes.

32. In regard to the bearings of the subject as they involve questions of jurisprudence, the facts are, summarily, that pregnancy may exist without the presence of any other structures within the ovaries than that, 1st, of one or more ruptured, but otherwise unchanged vesicles. 2d. Of one or more discharged follicles, stained yellow or black with blood. 3d. Of one or more broken vesicles partially converted into white or into brain-like bodies. 4th. Of one or more fully developed white bodies. 5th. Of one or more similar intra-mural cerebriform bodies. 6th. Of a single or of plural more or less perfect extra-mural cerebriform bodies. 7th. Of a single or of plural more or less developed corpora rubra, of either the intra or extra-parietal kind. 8th. Of any of the appearances now enumerated, associated with either of the others; and that these phenomena are to be regarded as having an essential connection with the state of pregnancy with a measure of probability which, as refers to the first four, is at present strictly hypothetical, but which, with the succeeding three, augments directly in the order in which they are arranged; while, on the other hand, it is proper to state that there is an abstract or hypothetical possibility that the appearances which are indubitably the usual adjuncts and indications of pregnancy, may yet, in certain presumable combinations of circumstances, (never, however, hitherto proven,) present themselves independently of conception.

33. The inherent faculty of the ovaries, owing to which they vary their functional action according to their relative condition, is illustrated by their secretion of structureless cells in childhood, so that these can then be discharged irrespective of the aid of any special orgasm of the parts; and, again, in pregnancy—by which the occurrence of superfœtation, otherwise a probable event, is rendered rare; and, again, during lactation—to the avoidance of the early renewal of impregnation; and, lastly, in the amenorrhœa of disease and age, when—the evolution of the vesicles not being any longer aided by menstruation, is anew facilitated, as in childhood, pregnancy, and early lactation, by the extreme tenuity of their coats. It is, again, illustrated in the formation of well-organized tenacious vesicles in the child-bearing period of life—so well adapted equally to the specific functions of that period, and also to prevent their wasteful rupture on the frequent occasions of excitement to which adult life is exposed; and receives, again, another proof in the superinduction of the menses at this time, without which the normal rupture of the follicles, for the purposes of reproduction, could not, on account of their increased organization, have been secured. The same accommodating quality of the ovaries is seen in cases where the menses have been suddenly arrested while the ovaries contained a number of the ripe vesicles always associated with that function; by such vesicles, no longer able, from the absence of menstruation, to penetrate the peritoneum, being translated, still covered by the peritoneum, to some part of the adjacent organs, where, separated from their nutrient vessels, they pass into the condition of inorganized bodies. The same principle comes into operation when, from any cause—such as the chronic peritonitis of children, the peritonitis which often follows abortion and pregnancy,

and that inflammation of the fimbria and tubes which so frequently takes place in prostitutes,—the tubes have become impervious, by the prevention, or speedy arrest, in such circumstances, of menstruation, and the consequent hindrance of the secretion of any other than such fragile, structureless, and small-sized vesicles, as can be easily and safely discharged without the aid of the tubes;—a species of amenorrhœa, therefore, which, should this view of its nature prove correct, ought to be regarded as inevitable, salutary, and not suited for treatment.

34. From De Graaf to Drs. Lee and Paterson, on the one hand, and from Malpighi to Negrier, on the other, physiologists have hitherto universally regarded the extrusion of ova from the ovaries as being effected by the agency of corpora lutea, only that, by the former series, these yellow bodies were supposed to be an effect of impregnation—a bastard modification of them being produced by sexual excitement and menstruation; while, by the other line, the same structures were believed to be formed by the coalition of several Graafian vesicles, the central bodies included within many of them, and which are nothing else than the contracted cadavers of the ruptured vesicles, being represented by most writers of both classes as the genuine ova.

35. In a like way, as Kerckring's announcement of ova being formed within the testes of mammals, was followed by speculations on their spontaneous excretion by the whole animal series, which would probably have terminated in a correct exposition of the physiology of the ovary but for the false principles introduced into the inquiry by De Graaf and Malpighi; so the demonstration, by Von Baer, of ova within the vesicles of the ovary, (although involved theoretically in the opinions previously held of the rupture of these by venereal orgasm, and in animals at the season of rut, and very tardily appreciated by those who treated the subject afterwards,) is probably to be regarded as the true point of departure of the opinions now entertained of the spontaneous elimination of ova from the ovaries of all classes of animated beings, and is equaled in importance only by the discovery made more recently by MM. Raciborski and Bischoff, of the same bodies—escaped from the ovarian vesicles without the aid of the males, within the tubes of the virgin mammal.

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2. *Physical and Physiological attributes of the Blood.*—Dr. G. O. Rees has recently offered some new views concerning the physical and physiological attributes of the blood.

1st. He has proved beyond doubt that the red corpuscles are vesicular, as is now generally supposed. Their vesicular character is clearly shown in the readiness with which they become collapsed or distended by increasing or diminishing the specific gravity of the medium in which they float. In order to collapse the corpuscles, a solution of sp. gr. 1060 is sufficient, but a solution of 1070 or more is required to produce a decided effect. Solutions cease to distend the corpuscles when of sp. gr. 1050 to 55, and to distend them well when a solution of 1015 or 10 is desirable. The sp. gr. of blood is about 1057 to 60; and since the corpuscles remain unaltered by solutions of from 1050 to 60, it may be concluded that the average sp. gr. of liquor sanguinis lies somewhere between these two points; and this proves that the fibrin of the blood is dissolved, and not merely suspended in the liquor sanguinis.

2d. He has also rendered decisive the question as to where the red colouring matter of the corpuscle is seated, proving it to be contained in the fluid within the vesicle, and that the envelops themselves are white or colourless membranes. This is shown by increasing the sp. gr. of the liquid in which the corpuscles float, the result of which is the escape by *exosmosis* of the red-coloured fluid from within the corpuscles;* and again by applying water to the corpuscles, and so inducing *endosmosis*, the vesicles become distended and burst, their colouring matter mixes with the water, and their envelops subside to the bottom of the vessel, forming a white layer.

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* This is effected by a method somewhat similar to the one employed by M. Figuier for estimating the quantity of red corpuscles in the blood (British and Foreign Medical Review, Jan. 1845, p. 254, Mr. Paget's Report). M. Figuier's method consists in adding a strong saline solution, as of sulphate of soda, to the fibrinated blood, by means of which the corpuscles (their contents being exosmosed) will subside, and may be collected on a filter.

3d. By examining the white layer deposited in the manner just mentioned (in which, together with *granules* and shreds of membrane, are found numerous white bodies resembling blood corpuscles, though smaller,) and from analogy, he entertains no doubt that the red corpuscles contain nuclei, which, however, are so highly refractive of light, that they are not distinguishable in the corpuscles themselves. He describes the nucleus as being about $\frac{1}{4500}$ of an inch in diameter, or $\frac{2}{3}$ the size of the red corpuscle, in the centre of which it is situated; it is flattened and circular like the corpuscle, though it differs from it in not being rounded at its edge; it is adherent to the envelop only at its centre, leaving a canal all round its free edge, which canal contains the red colouring matter.

4th. The whole of the iron of the blood is contained in the red colouring matter; the envelops and nuclei do not present a trace of it. The corpuscles obtain their iron from the chyle, the serum of which holds a large quantity of it in solution; the sp. gr. of the chyle is considerably lower than that of liquor sanguinis; consequently, when the former becomes mixed with the blood, it dilutes the liquor sanguinis, and so induces an endosmodic current rich in iron to enter the corpuscles. How the colour of the contents of the corpuscles is produced remains a mystery: it is within the red corpuscles alone that it is effected; there is no red colouring matter in lymph or chyle: any admixture of red corpuscles found in these latter is an accidental circumstance attending the mode of examination.

5th. Dr. Rees seems to admit the probability of the exudation and fibrinous corpuscles observed so abundantly in effused coagulable lymph, having their origin in the pale corpuscles of the blood, for he sees no difficulty in these pale corpuscles passing through pores in the blood-vessels which would not admit the red corpuscles; the latter he compares to bladders filled with fluid, and which are not capable of yielding until their membrane be ruptured, but the former being soft solids may be compressed like a sponge, and pass through an opening, the orifice of which is smaller than the corpuscles themselves.

6th. He justly condemns the coarse and necessarily inaccurate method hitherto pursued in the quantitative analysis of blood. Amongst other fallacies attending the present method, the corpuscles are estimated as hematosine alone, no allowance being made for the envelops or nuclei. Again, a certain quantity of fibrin will be estimated as hematosine, because, as the fibrin of the liquor sanguinis coagulates, the sp. gr. of the medium in which the corpuscles float, becomes lowered, and the corpuscles will thus draw into their interior more liquor sanguinis, and so absorb a certain quantity of fibrin with which they will subside. When the fibrin coagulates slowly, the quantity thus disposed of will be large, for each of the immense number of corpuscles will absorb a little. Again, *all* the water of the corpuscles should not be estimated as belonging to serum, because, although the corpuscles must have endosmosed some serum during coagulation of the liquor sanguinis, yet, in their natural condition, they contain a fluid which is quite distinct from serum. To obtain pure hematosine by a method free from these fallacies, Dr. Rees recommends the corpuscles to be cleaned by repeated washings in a solution of salt and water, or sugar and water, the sp. gr. of which is equal to that of the liquor sanguinis, so that the corpuscles may be unaffected by endosmosis. When thus cleansed, they are to be moved into a vessel of water, the result of which is, that the individual corpuscles swell and burst, their colouring matter is discharged into the water, whilst the nuclei and envelops subside as a precipitate; both ingredients are thus in a fit condition for estimation and further examination.

7th. In regard to *genesis*, or the original formation of blood corpuscles, he considers that they multiply by division, for on examining a portion of blood maintained at about its natural temperature, he observed the corpuscles to assume an hour-glass form, which increasing, eventually divided each corpuscle into two unequal sized circular bodies, which, when treated with a strong saline solution, underwent the same exosmotic changes as observed in common blood-corpuscles. When worn out, the blood-corpuscles become disintegrated and their debris exist floating in the liquor sanguinis. By diluting the serum of coagulated blood with water, a precipitate forms, consisting of the envelops and nuclei of old corpuscles disintegrated; this disposal of the worn-out corpuscles will account for the traces of iron occasionally found in the serum.

8th. Dr. Rees considers the explanation offered by Müller regarding the mode in which the change of colour from dark to bright red is effected in the blood during its passage through the lungs, to be entirely hypothetical and erroneous. Müller accounts for the change of colour from venous to arterial, and from arterial to venous blood in this way.* He supposes that "in traversing the capillary system of the lungs the proteine of the blood combines with oxygen, generating a compound analogous to 'buffy-coat,' which forms a contractile covering to the blood-corpuscles, causing them to become more opaque, and giving them the figure of doubly concave lenses; that in the general capillary circulation, this layer of oxyproteine surrounding the corpuscles is decomposed, the oxygen being used for dissolving old tissue, and the proteine deposited to supply its place. The corpuscles lose their reflecting concave figure, and become more transparent by this change. That the difference of colour between arterial and venous blood depends solely upon a physical difference in the surfaces of the corpuscles, being semi-opaque concave mirrors in the former and more transparent convex bodies in the latter; and that during respiration the colouring matter itself of the blood undergoes no change, and indeed plays no part, either as a whole, or in regard to the iron which exists merely as a simple element in it." To these several views Dr. Rees is entirely opposed; he rejects the idea of a layer of plastic oxyproteine being deposited on the blood-corpuscles during respiration, and instead of considering the hematosine as undergoing no change, and maintaining the same condition in arterial and venous blood, he looks upon it as being the cause of the change in the colour of the blood in virtue of some chemical alteration which takes place in it. In this view he agrees with Liebig, though he does not adopt the explanation offered by this chemist as to the nature of this alteration. According to Liebig, the change in colour observed to take place during the passage of venous blood through the lungs is due to the formation of a carbonate of the peroxide of iron in the red corpuscle, which, during the passage of arterial blood through the system, is resolved into carbonate of the protoxide, by the abstraction of oxygen for the general purposes of the system, and thus the dark colour is again restored to the blood. This hypothesis is mainly disproved by the impossibility of obtaining any trace of an oxide of iron from the red corpuscles by treating them with a weak acid, by there being no difference in the quantity of oxygen in arterial and venous blood, and by all the iron admitting of extraction from the hematosine, without the other chemical constituents of the hematosine being interfered with, and especially without any diminution in the quantity of its oxygen being effected. What may be the nature of this change, therefore, in the hematosine [if any does really exist] on which the alteration in the colour of blood depends, remains still a mystery.

Having accounted for the change in colour in the blood whilst in the body by the alternate deposition and removal of a layer of plastic material by which an alteration in the form of the corpuscle is produced, and the change in colour follows as an optical effect, Müller proceeded to explain in a similar manner the changes in colour undergone by the blood under various circumstances out of the body, such as result from exposure to the action of saline solutions of water and other reagents; in all these cases he considers that an alteration in the figure of the corpuscle is the cause of the change in colour observed, and that anything which produces this alteration in figure is capable of modifying the tint of the blood. Thus he considers that solutions of salt render a coagulum of blood of a bright red colour by exosmosing the corpuscles, and thus making them assume a biconcave form, and that when the corpuscles are endosmosed, and assume a convex form [as by washing the reddened coagulum in water] the colour of the blood is darkened in consequence; but Dr. Rees considers this statement to be incorrect, for saline matters will render a coagulum of a bright red colour, whether an endosmotic or an exosmotic action be induced; besides, blood-corpuscles may be changed in form, without any variation in the colour of the blood being produced in consequence. Moreover, strong saline solutions cause the corpuscles to become flaccid and empty, and not to assume that biconcave form which Müller considers so well calculated for the reflection of light. Müller and others conceive that the iron in the hematosine has nothing to do with the colour of the blood, inasmuch as this metallic ingredient may be removed without the colour being destroyed: Dr. Rees objects to this being received as a conclusive argument against the iron being essential to the formation of the red colour.—*Ranking's Abstract.* Vol. I.

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* Dr. Golding Bird, in London Medical Gazette, December 27, 1844.

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3. *Formation of the buffy-coat.*—Mr. Gulliver[*] has given the results of some experiments on the coagulation of the blood, which seem to add confirmation to the view entertained by Mr. Wharton Jones and others, that the formation of the buffy coat is due in great measure to an increased aggregation between the red corpuscles, by which these latter tend to arrange themselves in rolls, and consequently to subside to the bottom of the vessel more readily than they would do as individual corpuscles. With this tendency to rapid subsidence there is also usually combined a slowness in the coagulation of the liquor sanguinis, so that the corpuscles have time to leave the upper layers before coagulation commences. Mr. Hewson and Dr. Davy, however, maintain, that the rapid sinking of the corpuscles is due to an attenuation of the liquor sanguinis, but against this Mr. Gulliver argues, that if we admit the sinking of the red corpuscles to afford an accurate test of the consistency of the liquor sanguinis, we must also admit what seems improbable, that the liquor sanguinis becomes thinner some minutes after the blood has been withdrawn, for at that time the falling of the red corpuscles is most rapid. Following are some of Mr. Gulliver's conclusions:—

1st. There is a remarkable acceleration after a few minutes, in the rate of which the blood-corpuscles sink into the liquor sanguinis. 2d. This acceleration may be increased by increasing the aggregation of the corpuscles; and prevented or reversed by preventing or destroying the aggregation of the corpuscles. 3d. The sinking of the corpuscles is slower in blood thickened by weak saline solutions, than when mucilage is added with the salt. 4th. The sinking of the corpuscles may be slower in serum artificially made thicker and heavier. 5th. In the cruor of horse's blood, the corpuscles are more aggregate, and have a greater appearance of agglutination, than in very buffy human blood. 6th. There may be a buffy coat, or only a comparatively thin one, in the blood of the horse, when the blood has been made thinner, and its coagulation retarded. 7th. The corpuscles of the horse sink much more quickly in his serum than the corpuscles of man do in his. 8th. Increasing the proportion of corpuscles in the blood hastens coagulation, and prevents or diminishes the formation of the buffy coat, more than increasing the serum only.—*Ibid.*

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4. *Intestinal villi. Lacteal absorption.*—It has long been a matter of difficulty to explain how chyle, or the nutritive portion of chyme, found its way into the lacteals. The fancied existence of mouths or openings at the extremities of the lacteal tubes, as described by Mr. Cruikshank and Dr. William Hunter (and generally admitted during the period in which they wrote), as explanatory of the mode in which the lacteals and lymphatics in general performed their functions, seemed to remove this difficulty; but the researches of Krause, Valentin, and others, having disproved the existence of orifices in the lacteals, the mystery of absorption remained as great as before. Mr. Goodsir,[†] a few years ago, was one of the first to suggest that the process of lacteal absorption is effected through the medium of cells; and by recent observations, he has proved almost beyond question that cells are the real agents by which the selection and absorption of the nutritive portions of the chyme take place. When viewed in this light, the matter is greatly simplified, especially since it is almost certain that nearly all the changes which are constantly occurring in the whole organic kingdom, on the grandest as well as the simplest scale, are effected through the agency of those

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[*] In a paper read to the London Medico-Chirurg. Society, an abstract of which is contained in the Medical Times, Feb. 22, 1845, p. 453.

[†] Edinburgh Philosophical Journal, July, 1842.

minute, yet all-important bodies—nucleated cells. These cells seem endowed with a peculiar independent vitality, by means of which, at the time that they grow themselves, they are absorbing into their interior, from the surrounding medium, materials which they can convert either into the elements of tissue, as of muscle, nerve, bone, &c., if nutrition be the function assigned to them; or into some peculiar fluid of secretion, as of milk, bile, saliva, &c., if secretion be their especial object. Thus, growing themselves, they produce the growth of others, and by feeding themselves, they draw off waste materials from the body, and render them subservient to further useful purposes in the economy, or eject them from the system as refuse, by the natural outlets. The following comprises the substance of Mr. Goodsir's paper on the intestinal villi.* 1. Each time chyme passes along the intestines, the villi receive an increased supply of blood; they become turgid and erect, and the epithelium covering them is cast off, so that the chyme can come into actual contact with their exposed surface. 2. At the same time, the epithelia lining the follicles of Lieberkühn are also thrown off, and mix with the chyme contained in the intestines; they probably contain a secreted fluid, subservient to the process of chylification. 3. Each villus, besides its one or two looped lacteals, and the minute network of blood-vessels lining its walls, contains, in its quiescent state, scattered amongst the terminal loops of the lacteals, numerous granular particles which are the germs or nuclei of absorbing vesicles; during the process of chyme absorption, these minute germs become gradually developed into vesicles, probably by deriving nutriment from the neighbouring blood-vessels. Whilst they increase in size, these vesicles, by virtue of their peculiar absorbing power, draw into their interior certain materials from the chyme surrounding the villi, which they probably elaborate; having attained their full size, they burst, and discharge their contents either directly into the lacteals, or, more probably, into the texture of the villus, whence they are taken up by the lacteals. The function of the lacteals thus seems to consist in removing the debris and contents of the dissolved chyle cells. 4. Each villus is permanently covered (as also are the follicles of Lieberkühn lined) by a fine, smooth, germinal membrane,† containing in its substance germinal centres of an oval form, situated at pretty regular distances, the office of which is the production of fresh epithelium cells to cover again and protect the surface of the villus, after the absorption of chyme is ended. 5. This mode of absorption by the chyle cells renders the analogy very striking between intestinal villi and the spongioles of plants: the latter of which most probably absorb nutriment for the plant through the medium of their cells. The soil in this latter case holds a relation towards the spongioles somewhat similar to that of chyme towards the villi. 6. It is probable that in the villi, as also in the spongioles of plants, the absorbed alimentary matters undergo the first steps of the organizing or vitalizing process.

The only difficulty which presents itself in the above theory of Mr. Goodsir, regarding the mode of absorption by the cells of the intestinal villi, is to understand how these cells can absorb materials for their own growth from the neighbouring blood-vessels, at the same time that they are also absorbing materials for the formation of chyle from the matters contained in the intestines; but this difficulty vanishes when we remember the wonderful endowments of cells in general, the power of selection and disposal of materials which they possess, together with other properties, showing that they are gifted with a peculiar independent vitality, to enable them to discharge certain important functions, the kinds of which vary according to the organs or tissues in which the cells are placed; besides, it does not seem improbable that, in the case of the cells of the intestinal villi, their own growth may be effected by means of the materials which they absorb from the chyme for the formation of chyle, and thus may be independent of the blood-vessels; for it does not appear that they ever grow, except when chylification is going on.

The epithelial coat of the villi seems to be chiefly destined for the protection of their surface at those times when absorption is not going on, since it is in all cases cast off when the process of absorption commences; probably, also, in common with the epithelium lining the follicles of Lieberkühn, it serves some further purpose in preparing the chyme for absorption. Proof that the epithelial coat is thrown off during the passage of chyme along the intestines, removes the difficulty which it was conceived the cells would experience in effecting their absorption through the layer intervening between them and the chyme. The thin germinal membrane would be no impediment to the process of absorption; on the contrary, it would rather be favourable to it. Mr. Fenwick, of North Shields, has performed numerous experiments, and worked out very elaborately the subject of lacteal and lymphatic absorption, though the results he has attained do not help much in clearing the mystery which still, to a certain extent, hangs over this department of physiology.*—*Ibid.*

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* Anatomical and Pathological Observations, by John and H. D. S. Goodsir, 1845, p. 4.

† See account of Germinal Membranes and Germinal or Nutritive Centres, by Goodsir.

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5. *Centres of Nutrition.*—Mr. Goodsir, (*Anatomical and Pathological Observations*, p 1,) has recently made several important additions to the doctrine of cell-formation. Amongst other observations he states that, besides all organs and tissues having their origin in and consisting essentially of simple or developed cells possessed of a peculiar independent vitality, these component cells are moreover divided into numerous departments, each of which consists of several cells arranged round one central or capital cell, which latter is the source whence all the other cells in its own department have derived their origin. To each of these several central nucleated cells, he applies the name of *nutritive centre*, or germinal spot. Each nutritive centre possesses the power of absorbing materials of nourishment from the surrounding vessels, and of generating, by means of its nucleus, successive broods of young cells, which from time to time fill the cavity of the parent cell, and carrying with them its cell-wall, pass off in certain directions and under various forms, according to the texture or organ of which their parent forms a part. There are two kinds of nutritive centres, those which are peculiar to the textures, and those which belong to the organs. The former are in general permanent, the latter are mostly peculiar to the embryonic state, and ultimately disappear. There is one form in which the nutritive centres are arranged both in healthy and morbid parts, which constitutes what Mr. Goodsir calls a *germinal membrane;* it is only met with on the free surface of organs or parts; it is a fine transparent membrane, and consists of cells arranged at equal and variable distances within it; the cavities of these component cells are flattened, so that their walls form the membrane by cohering at their edges, and their nuclei remain in its substance as the germinal centres. One surface of the membrane is attached to the surface of the organ or part, and is therefore applied upon a more or less richly vascular tissue; the other surface is free, and it is on it only that the developed or secondary cells of its germinal spot are attached. These secondary cells, whilst forming, are contained between the two layers of the germinal membrane, but, as they become fully developed, they carry forward the anterior layer and become attached to the free surface, whilst the nuclei are left in the substance of the posterior layer, in close contact with the blood-vessels from which they derive the materials for the formation of new cells.—*Ibid.*

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6. *Functions of the cerebrum and cerebellum.*—Dr. Cowan (*Provincial Medical and Surgical Journal*, April 16th, 1845), has related two cases of encephaloid carcinoma of the brain, the details of which offer some points of considerable physiological interest. One case is peculiarly instructive, as showing the great amount of cerebral lesion which may exist without being accompanied with any disturbance of the intellectual faculties, and with but slight interruption to the functions of the nervous system generally. The case was chiefly characterized during life by the occurrence of paroxysms of severe pain in the head, which was at first limited to the left side, but eventually became general. These paroxysms were accompanied by severe pain in the right arm and right leg, during the continuance of which the right arm was relaxed and motionless, but regained its power when

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* The results of his investigations are contained in four consecutive numbers of the Lancet, commencing Jan. 11, 1845.

the pain subsided; this was the only appearance of paralysis noticed; as far as could be ascertained, the sensibility of the arm was not diminished, and the right leg did not participate in the temporary paralysis of motion. There was occasional disturbance of vision in the right eye; and tinnitus of the right ear was a constant symptom; it consisted of a whizzing pulsating noise. There was no appreciable mental disturbance, and the patient walked down stairs the day on which she died. On examining the brain, the greater portion of the medullary substance of the right hemisphere, as also a large portion of that of the left hemisphere, was found converted into a red pulpy mass, presenting all the characters of ordinary encephaloid carcinoma. The gray portion was perfectly healthy to all appearance, which seems to support the favoured doctrine that it is the seat of the intellectual powers. Dr. Cowan suggests that the constant tinnitus may be explained by considering it to have been dependent on the pulsation of the diseased and softened middle lobe resting on the temporal bone, combined also with the morbidly increased sensibility of the parts.

The second case is still more interesting and instructive. It seems to prove very strikingly the truth of the now generally admitted opinion, that the chief function of the cerebellum is to produce a combined and harmonious action of the several muscles called into movement for the attainment of a given end, as in locomotion, &c. It also, as well as the last, illustrates the apparent dependence of the intellectual faculties on a healthy condition of the gray cerebral matter.—On examining the brain in this case, there was found a mass, presenting the characters of encephaloid carcinoma, incorporated with the anterior extremity of the left lobe of the cerebellum, of which it seemed a prolongation; passing forward in inseparable connection with the pons, and following the emerging fibres of the corresponding crus cerebri, it terminated about an inch further (without penetrating the ventricle), in the medullary substance of the middle lobe of the left hemisphere; the principal seat of the morbid change was in the commissural fibres which contribute to the formation of the pons. The medullary substance was alone diseased, the gray matter being distinct, and to all appearance healthy. The several nerves passing through the diseased mass were more or less vascular and soft, which would account for the various disturbances in function presented during life by the parts to which they were distributed, as deafness, &c.

The chief points in the symptoms of this case to which attention need be directed in this notice are, that there was no paralysis of motion or sensation to the last, no convulsive movements, neither was one side of the body more distinctly implicated than the other, but the controlling, the co-ordinating power of the muscular system appeared abolished or nearly so; thus, in the early part of the affection, the patient staggered during walking, as if slightly intoxicated, and was unable to direct her progress in a straight line, she constantly deviating to the left; as the disease advanced, the irregularity in the voluntary movements increased, and gradually affected the arms as well as the legs. She required to be held and directed in every act, supported at times by two assistants, and pushed forwards by a third to enable her to move about the room; and if by accident she fell when attempting any effort alone, she was quite unable to rise or to assist herself. She was perfectly sensible throughout, and the only change in her mental condition was a kind of restless excitement, with a certain indescribable feeling of distress, a childishness of thought with great feebleness of memory and attention: often intervals of unexpected and remarkable revival of natural feelings and mental powers would occur, the cause of which is quite inexplicable.—*Ibid.*

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7. *Structure of the human Placenta.*—In giving an abstract of the following observations on the structure of the placenta by Mr. Goodsir, it will render the subject more intelligible to divide it into three heads, as adopted in the original memoir:—

1st. Each placental tuft consists of a trunk, of primary branches, and of secondary branches or villi. Each villus is made up of the following parts: (*a*) An *external* fine transparent membrane. This membrane is common to the whole tuft, passing from one villus to another, and closely covering the free surface of each. (*b*) A layer of flattened nucleated cells beneath this membrane, (*external cells* of the villus;) here and there these cells are grouped together into heaps, in the centre of which is a germinal spot, which is engaged in the constant formation of new cells. It seems probable that the internal aspect of this layer of cells is lined by a fine membrane, as in the case of the intestinal epithelium. (*c*) Beneath these structures, and immediately surrounding the blood-vessels within the villus, is another still finer and more transparent, but firm and strong membrane (*internal membrane* of the villus). This is readily separable from the layer of cells described: the space between them is probably occupied by a peculiar fluid. (*d*) Within this membrane are the blood-vessels of the villus, consisting of one or sometimes two vessels, which form a simple or contorted loop occupying the cavity of the villus; they are derived from the umbilical arteries and veins; they differ from capillaries in their large size, and from arteries and veins in preserving the same mean diameter throughout: one such vessel occasionally passes from one to two or more villi, forming a loop in each, before it becomes continuous with a vein. (*e*) Between these vessels and the internal membrane are some other cells, nucleated and highly transparent, called the *internal cells* of the villus.

2d. (*a*) The substance of each tuft of the chorion is made up of nucleated cells of various sizes, containing a granular fluid. (*b*) The surface of the tuft is covered by a fine membrane, which consists of flattened cells united by their edges. (*c*) The free extremity of each villus of the tuft is bulbous, and consists of transparent cells arranged round a central germinal spot. These groups of cells are the active agents by which the villi grow. (*d*) As gestation advances, and the allantois becomes applied to the internal surface of the chorion, blood-vessels become developed within the villi, which then communicate with the umbilical vessels. (*e*) Thus, then, the villi of the chorion form the internal (or fœtal) portion of the placental villi, previously described,—the loops of vessels, internal cells, and internal membrane of which have their origin in the villi of the chorion.

3d. (*a*) When impregnation has taken place, the mucous membrane of the uterus becomes greatly developed; the epithelial or cellular secretion of its follicles becomes augmented, and the vascular network occupying the outer follicular spaces becomes increased in size and extent. By this means a new layer or membrane is produced, the *membrana decidua*, which consists of two portions, the thickened vascular mucous membrane and the non-vascular cellular substance secreted by the follicles. The former constitutes at a later period the *decidua vera*, the latter the *decidua reflexa*. (*b*) As the (impregnated) ovum reaches the uterus, the developed mucous membrane or decidua begins to secrete, the os uteri becomes plugged up with a portion of the secretion, and the cavity of the uterus is filled with fluid—around the ovum this secretion consists of spherical nucleated cells, which possess the power of undergoing further development after being detached from the germinal spots or membrane of the secreting organ. These cells around the chorion of the ovum come to constitute the *decidua reflexa*. (*c*) Thus the tufts of the chorion are imbedded in a mass of nucleated cells, which cells are constantly being secreted from the follicles of the uterus, and which in all probability contain within them, as they become fully developed, the nutritive materials, which the absorbing cells of the villi of the chorion are constantly taking up for the nourishment of the ovum. This cellular secretion seems thus to be to the ovum of the mammal what the albuminous fluid is to the ova of oviparous animals. (*d*) As the ovum increases in size, the amount of nutriment absorbed by the cells alone, is not sufficient for its wants; the allantois becomes applied to the inner surface of the chorion, and blood-vessels become developed within the tufts and villi. The vessels of the decidua vera at the same time enlarge and assume the appearance of sinuses encroaching on the space formerly occupied by the cellular substance of the decidua reflexa, in the midst of which the villi of the chorion are imbedded. Thus the lining membrane of the vascular system of the mother becomes the *external membrane* surrounding the villi of the placenta. It lines the whole placental cavity, passing from tuft to tuft, and villus to villus, forming in this way threads and bands of venous membrane, which are tubular and filled with cells. These cells are continuous in the one direction with the *external cells* of the placental villi, and in the other with the gelatinous cellular substance constituting the *parietal portion* of the placental decidua, which is in connection with the wall of the uterus. The *central portion* of the placental decidua consists of the external cells and external membrane of the placental villi.

It appears from the above:—

1st. That the placental tufts and villi are made up on the one hand by the tufts and villi of the chorion, comprising umbilical vessels, internal membrane, and internal cells; and on the other hand by the lining membrane of the maternal vascular system, with a layer of cells beneath it, comprising the external membrane and external cells—the first portion is peculiar to the fœtus, the latter to the mother.

2d. These external cells are the remains of the decidua reflexa; they are still continuous with the cellular substance of the parietal placenta, by means of the cells filling the tubular threads of venous membrane.

3d. The function of the external cells is to secrete from the maternal blood (from which they are separated only by the external membrane) the materials of nutrition destined for the fœtus; this function is analogous to the digestive one performed by the intestinal mucous membrane in extra-uterine life.

4th. The function of the internal cells or those belonging to the fœtus is to absorb through the internal membrane the materials secreted from the maternal blood by the external cells. This matter is then taken up by the umbilical vessels and carried away for the nourishment of the fœtus. These internal cells perform a function analogous to that effected in extra-uterine life by the absorbing chyle-cells of the intestinal villi.

5th. Hence the placenta discharges not only the functions of a lung, but also of an intestinal canal to the fœtus.—(*Anatomical and Pathological Researches*, by John and H. D. S. Goodsir.)—*Ibid.*

ORGANIC CHEMISTRY.

8. *Nature of the Green Alvine Evacuations of Children.*—By Golding Bird, M. D., (*London Medical Gazette*, Sept., 1845.) Whilst the attention of the practitioner has been constantly drawn to the frequent occurrence of bright green dejections in the aliments of infants, but little has been done towards determining their real nature and chemical composition. Dr. Bird has recently examined the green evacuations passed by a hydrocephalic child whilst under the influence of mercury, and which presented the following characters. "It was a dirty-green turbid fluid, which, by repose in a glass vessel, separated into three very distinct portions—1, a supernatant fluid, of oil-like consistence, presenting a brilliant emerald-green colour; 2, a dense stratum of mucus, coagulated albumen, and epithelial debris, mixed with red particles of blood; 3, a deposit, occupying the lower part of the vessel, of large crystals of triple phosphate of magnesia and ammonia, in fine prisms of an apple-green colour.

The supernatant emerald-green fluid was decanted for examination.

The following is a view of the results of the examination:—

Alcoholic Extract	Organic	24·50
	Inorganic	5·50
Aqueous Extract	Organic	11·25
	Inorganic	1·75
Insoluble Matter	Organic	56·00
	Inorganic	1·00
Water and Volatile matter		900·
		1000

Regarding the chemical constitution of the organic portion of the alcoholic and aqueous extracts, the former consisted chiefly of fatty matter, cholesterine, and a green substance, probably identical with the so-called *Biliverdin*,[*] with mere traces

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[*] Medizinisch-Analytische Chemie, von Franz. Simon: bd. 1., s. 333.